

REMARKS

This Amendment is fully responsive to the final Office Action dated January 4, 2010, issued in connection with the above-identified application. A request for continued examination accompanies this Amendment. Claims 14-26 are pending in the present application. With this Amendment, claims 14 and 26 have been amended. No new matter has been introduced by the amendments made to the claims. Favorable reconsideration is respectfully requested.

I. Interview Summary

The Applicants thank Examiner Cerullo for granting the telephone interview (hereafter “interview”) conducted with the Applicant’s representative on March 31, 2010. During the interview, the distinguishable features between the present invention (as recited in independent claim 14, as an exemplary independent claim) and the cited prior art were discussed in detail. Proposed claim amendments to more clearly distinguish the present invention (as recited in independent claim 14) from the cited prior art were also discussed.

It was noted that the present invention (as recited in independent claim 14) is distinguishable from the cited prior art in that the range of the transmittance to be used for display is divided into a plurality of division ranges, and a different pair of gamma-characteristics and a different distribution area are used with respect to each of the division ranges. It was also noted that independent claim 14 has been amended to more clearly point out this feature.

At the conclusion of the interview, the Examiner agreed that the proposed amendments would likely be sufficient to overcome the current prior art rejections if filed in a formal response to the Office Action. However, the Examiner indicated that it may be helpful to provided additional information regarding the advantages of the above features of the present invention over, for example, the Matsushita reference. The Examiner also indicated that further search and consideration of the prior art would be necessary before making a final determination regarding the allowability of the claims.

II. Rejections under 35 U.S.C. 103

In the Office Action, claims 14-16 and 23-26 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ohi et al. (U.S. Patent No. 5,847,688, hereafter “Ohi”) in view of Matsushita (Japanese Publication No. JP 2003-255908, hereafter “Matsushita”), and further in view of Greier et al. (U.S. Publication No. 2002/0149598, hereafter “Greier”).

The Applicants have amended independent claims 14 and 26 to help further distinguish the present invention from the cited prior art. The amendments to independent claims 14 and 26 are consistent with the amendments proposed during the interview with the Examiner conducted on March 31, 2010. For example, independent claim 14 (as amended) recites the following features:

“[a] matrix-type display apparatus which drives a display panel including a plurality of pixels disposed in matrix form and displays an image, comprising:

a converting portion adapted to gamma-convert an input video signal, using n (which is an integer of two or above) pairs of gamma-characteristics each made up of first and second gamma-characteristics different from each other, the gamma-characteristics being a transmittance characteristic according to an input level, the n pairs of gamma-characteristics being different from each other; and

a selecting portion adapted to specify a transmittance to be used for display based on the input video signal, to select one pair of gamma-characteristics from among the n pairs of gamma-characteristics according to the specified transmittance to be used for display, and to select an output supplied to the display panel from among the $2n$ outputs which are gamma-corrected by said converting portion, so that a ratio between a first distribution area of pixels driven by the video signal gamma-corrected by use of the first gamma-characteristic of the selected pairs of gamma-characteristics and a second distribution area of pixels driven by the video signal gamma-corrected by use of the second gamma-characteristic of the selected pairs of gamma-characteristics is equal to a distribution area ratio specified in advance for the selected pairs of gamma-characteristics and with respect to a plurality of division ranges each division range being different and set by dividing a range of transmittance to be used for display, a different pair of gamma-characteristics and a different distribution area ratio are used.” (Emphasis added).

The features emphasized above in independent claim 14 are similarly recited in independent claims 26 (as amended). Specifically, independent claim 26 is directed to a method that recites steps directed to the features emphasized above in the apparatus of independent claim 14. Additionally, the features emphasized above in independent claim 14 (and similarly recited in independent claim 26) are fully supported by the Applicants’ disclosure (see e.g., Fig. 2-6, and the supporting discussion).

The present invention (as recited in independent claims 14 and 26) is distinguishable

from the cited prior art in that the range of the transmittance to be used for display is divided into a plurality of division ranges, and a different pair of gamma-characteristics and a different distribution area are used with respect to each of the division ranges.

For example, as shown in Figs. 2-6, if the transmittance to be used for display is within the range of 0 to TA, the liquid-crystal panel 10 can be driven using the video signal as γ corrected by use of the first type or synthetic γ -characteristic γ_A which is least shifted from the reference γ -characteristic γ_f . If the transmittance to be used for display is within the range of TA to TB, the liquid-crystal panel 10 can be driven using the video signal as γ corrected by use of the second type of synthetic γ -characteristic γ_B which is least shifted from the reference γ -characteristic γ_f . And, if the transmittance to be used for display is within the range of TB to TC, the liquid-crystal panel 10 can be driven using the video signal as γ corrected by use of the third type of synthetic γ -characteristic γ_C which is least shifted from the reference γ -characteristic γ_f . No such features of the present invention are believed to be disclosed or suggested by the cited prior art.

In the Office Action, the Examiner relies on the combination of Ohi, Matsushita and Greier for disclosing or suggesting all the features recited in independent claims 14 and 26.

As noted above, independent claims 14 and 26 have been amended to be consistent with the amendments proposed during the interview conducted on March 31, 2010. Specifically, independent claims 14 and 26 have been amended to point out that the range of the transmittance to be used for display is divided into a plurality of division ranges, wherein a different pair of gamma-characteristics and a different distribution area are used with respect to each of the division ranges.

During the interview on March 31, 2010, the Examiner agreed that the proposed amendments to independent claim 14 would be sufficient to overcome the current prior art rejections. Accordingly, the amendments to independent claim 14 and 26 should clearly distinguish the claims from the cited prior art.

Briefly, Ohi discloses that in a liquid crystal display apparatus, the gamma characteristics of an image signal is changed each two frames so that a driving voltage obtained from the changed gamma characteristics is applied to a liquid crystal.

However, Ohi fails to disclose or suggest n pairs of gamma-characteristics being different from each other, and accordingly to the transmittance to be used for display, a different pair of

gamma-characteristics and a different distribution area ratio are used. Therefore, Ohi fails to disclose or suggest the features now added to claims 14 and 26 (i.e., “with respect to a plurality of division ranges each division range being different and set by dividing a range of transmittance to be used for display, a different pair of gamma-characteristics and a different distribution area ratio are used.”).

Matsushita discloses different pairs of gamma-characteristics that include three pairs of gamma-characteristics $R\gamma_1$ and $R\gamma_2$, $G\gamma_1$ and $G\gamma_2$, and $B\gamma_1$ and $B\gamma_2$ with respect to different colors and two pairs of gamma-characteristics γ_1 and γ_2 , and γ_1' and γ_2' with respect to an image part having a high priority of a viewing angle enhancement effect or an image part having a low priority of a viewing angle enhancement effect (see e.g., Fig. 1 and Fig. 11). However, the present invention (as recited in independent claims 14 and 26) is different from Matsushita and provides advantages over Matsushita for the reasons noted below.

In Matsushita, different pairs of gamma-characteristics are used with respect to each of the colors. Although it is possible to select an optimal pair of gamma-characteristics with respect to each color, only one type of gamma-characteristic pair is used for the entire range of the transmittance to be used for display. Therefore, it is impossible to use an optimal pair of gamma-characteristics with respect each division range obtained by dividing a range of the transmittance to be used for display.

In contrast, in the present invention (as recited in independent claims 14 and 26) with respect to a plurality of division ranges, each division range is different and set by dividing a range of transmittance to be used for display, wherein a different pair of gamma-characteristics and a different distribution area ratio are used. With this feature of the present invention (as recited in independent claims 14 and 26), an optimal pair of gamma-characteristics closest to the reference γ -characteristic γ_f at the front vision (zero degrees) can be used with respect to each of the division ranges, which helps to realize the most suitable viewing angle characteristic; that is, the most suitable viewing angle characteristics can be realized with respect to a broad transmittance range.

Accordingly, Matsushita fails to disclose or suggest that a range of the transmittance to be used for display is divided into a plurality of division ranges, wherein a different pair of gamma-characteristics and a different distribution area is used with respect to each of the division ranges, as recited in independent claims 14 and 26 (as amended).

Greier discloses an LCD having an improved viewing angle, wherein one group of pixels is made brighter, and another group of pixels is made darker (see e.g., ¶[0020]- ¶[0021]). Additionally, Greier discloses that a distribution area is a ratio of bright/dark pixels, and the number of bright and dark pixels is balanced, in which 50% of the pixels are bright and 50% are dark, or some other ratio of bright and dark pixels, such as 66% dark pixels and 33% bright pixels. However, Greier still fails to overcome the deficiencies noted above in Ohi and Matsushita.

That is, Greier fails to disclose or suggest that with respect to a plurality of division ranges, each division range is different and set by dividing a range of transmittance to be used for display, wherein a different pair of gamma-characteristics and a different distribution area ratio are used.

Based on the above discussion, no combination of Ohi, Matsushita and Greier would result in, or otherwise render obvious, independent claims 14 and 26 (as amended). Likewise, no combination of Ohi, Matsushita and Greier would result in, or otherwise render obvious, claims 15, 16 and 23-25 at least by virtue of their dependencies from independent claim 14.

In the Office Action, claims 17-22 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ohi, Matsushita and Greier, and further in view of Yamashita.

Claims 17-22 depend from independent claim 14. As noted above, Ohi, Matsushita and Greier fail to disclose or suggest all the features recited in independent claim 14 (as amended). Additionally, Yamashita fails to overcome the deficiencies noted above in Ohi, Matsushita and Greier. Accordingly, no combination of Ohi, Matsushita, Greier and Yamashita would result in, or otherwise render obvious, claims 17-22 at least by virtue of their dependencies from independent claim 14.

III. Conclusion

In light of the above, the Applicants submit that all the pending claims are patentable over the prior art of record. The Applicants respectfully request that the Examiner withdraw the rejections presented in the outstanding Office Action, and pass the application to issue.

The Examiner is invited to contact the undersigned attorney by telephone to resolve any remaining issues.

Respectfully submitted,

Katsuyuki ARIMOTO et al.

/Mark D. Pratt/

By 2010.04.05 14:30:50 -04'00'

Mark D. Pratt
Registration No. 45,794
Attorney for Applicants

MDP/clw
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
April 5, 2010